by the State in providing educational facilities for these leaders of men is a profitable investment.

At present, the Government grant to meet expenditure in respect of elementary education is about 11,500,000*l.* annually; and the sum paid in grants for pupils in secondary schools in England and Wales taking an approved course between the ages of twelve and sixteen years is about 340,000*l.* In addition, local authorities expend about 3,400,000*l.* a year on education other than elementary. Of this amount, about 700,000*l.* is expended on secondary schools, 1,200,000*l.* on evening schools and institutions for higher and technical education and 260,000*l.* upon day schools of similar scope. The State-aid and rate-aid to the seven hundred secondary schools, now accommodating about 113,000 pupils in England and Wales, amounts, therefore, to rather more than one million pounds annually.

This is a modest sum compared with expenditure upon other objects, but little increase can be justified for secondary schools until the demand for secondary education is greater and more real than at present. Free education from the primary school to the university may be within the realm of practical politics, but unless it is accompanied by maintenance grants equivalent to the wage-earning capacities of poor students it will not satisfy the demands of the Trade Unionists. Whether it is desirable to offer this inducement to continued study to all children may be doubted; the nation should be concerned only in providing adequate opportunities for the development of children whose life-work is likely to promote national welfare. The way should be open from the primary school to the university, but a passport should be demanded at each gate to show that the student is capable of making the best use of the new fields to which he is admitted. By this system, and a judicious extension of the number of intermediate and senior scholarships to provide for maintenance, any student of distinguished ability would be able to command the highest educational training this country can offer. R. A. G.

## *RADIUM INSTITUTES.*

THE March number of the *Deutsche Revue*[1] is to contain the announcement by Prof. P. Lenard, director of the Physikalische Institut of the University of Heidelberg, that a radium institute, of the kind already in process of formation in Vienna, London, and Berlin, is to be opened for work in Heidelberg in the Easter of the present year. Owing to the foresight and cooperation of the Senate of the University and the Ministry of the Grand Duchy of Baden, an endowment has been secured, and the Heidelberg Institute will thus be the first of its kind actually to come into existence and to commence work. It is to be known as the Radiologische Institut. The term *Radiology*, which we might also with advantage accept, is used in Germany to connote the newer branches of physics concerned with the study of the invisible radiations, particularly, of course, the kathode, Lenard, Röntgen, and Becquerel rays, but comprising also the older known invisible ultra-violet and infra-red light radiations, their methods of production, their relations to matter, including radio-activity, phosphoresence, and photo-electric action, and their practical applications, for example, in medicine.

Prof. Lenard prefaces his announcement with the remark that the new field of investigation has already proved itself of such fruitfulness that it is quite impossible at the present time to delimit its true circumference. Every day arise new problems, for example, in such fundamental subjects as the constitution of matter, now assailable with hope of success. The cultivation of this field demands special fostering, not only on account of its immediate fruitfulness, but also on account of the costliness of its prosecution—if only in the provision of those rare materials, like radium, which it has brought into recognition—and on account of the necessity for close cooperation between the scientific workers and those engaged in the practical applications of the new knowledge.

The new institute at Heidelberg is to undertake this work. It is to be under the same direction as the Physikalische Institut of the University, and will thus secure full benefit from the whole existing resources of the institute. Provisionally 300 square metres area in the Frederichsbau will be set aside for it. Later it will be housed in a special wing of the new buildings of the Physical Institute. The endowment will ensure the furnishing of the institute with the best equipment that can be secured, while the spring sediments from the neighbouring State of Kreuznach, to be worked up by the Government salt department, will provide a source of radio-active material for clinical and scientific investigation. The institute will provide special instruction in the subjects it deals with, while the clinical work will be undertaken by Herren Czerny and Krehl in their own buildings, but with close cooperation with the Physical Institute, which will ensure that the work rests upon a thoroughly sound scientific basis.

[1] Published by Richard Fleischer, of the Deutsche Verlags Anstalt.

The constitution and work of the Radium Institute to be established in London are described in an official statement published in the *British Medical Journal* of March 6. From this statement we learn that the King has consented to become the patron of the institute. A site has been acquired in Riding House Street, Portland Place, upon which the necessary building will be erected with as little delay as possible. In general terms, it may be said that the institute will be conducted upon the lines of the Radium Institute in Paris. In addition to the superintendent, the assistant to the superintendent, and the director of the laboratory, there will be an honorary medical and surgical staff (not yet appointed). The institute hopes to acquire radium to the amount of 5 grams.

The treatment carried out in the institute will be strictly limited to treatment by radium or other radio-active substances. Treatment of cases by the Röntgen rays, the Finsen light, and by electrical currents will have no place in the institute, as such measures of treatment are already very amply provided for elsewhere.

The building will be in two parts, with separate entrances. One section will be devoted to necessitous patients, and the other to the well-to-do. The former will be treated free; the latter will be required to pay fees on such a scale as the medical and surgical staff may determine. No patient, poor or well-to-do, will be treated in the institute except upon the imprimatur of a qualified medical man.

Demonstrations in the use of radium will be given, and medical practitioners can be advised as to the mode of employment and as to the radio-activity of their own specimens of radium.

## *THE SUMMER SEASON TIME BILL.*

THE debate upon the Summer Season Time Bill, commonly known as the Daylight Saving Bill, in the House of Commons on Friday last, was, for the most part, a pitiful exhibition of the incompetence of politicians to understand any question involving a knowledge of elementary science. Though the proposals in the Bill would dislocate the entire machinery of time-reckoning, less than forty members were present at the opening of the discussion; and

the House was only saved from being counted out on two occasions by sufficient members rushing in to form a quorum. The substance of the Bill was given in last week's NATURE. Briefly, it is proposed that at 2 a.m. on the third Sunday in April of each year, all clocks shall be put forward one hour, and shall remain in advance of Greenwich mean time and Dublin mean time by this amount until 2 a.m. on the third Sunday in September, when the hands are to be put back again.

We do not propose to repeat now the substantial arguments against this proposal stated in these columns on July 9, 1908, but we do suggest that the article could be read with profit by the members who voted for the second reading of the Bill, which was for the second time referred to a Select Committee of the House of Commons. During the debate many illustrations were used to convey to the minds of the members some idea of the relation between local time and mean time, and of daylight to business hours. No one pointed out, however, that it would be more reasonable to change the readings of a thermometer at a particular season than to alter the time shown by the clock, which is another scientific instrument. Perhaps it is contemplated to bring in a Bill to increase the readings of thermometers by ten degrees during the winter months, so that 32° F. shall be 42° F. One temperature can be called another just as easily as 2 a.m. can be expressed as 3 a.m.; but the change of name in neither case causes a change of condition.

The argument that inconvenience is not felt by travellers on the Continent changing their watches to mid-European and east-European time, or by the five standard times of America, has little bearing upon the question. The inhabitants of any of these regions use a particular standard time, as we use Greenwich time, but their hours of work and leisure are determined by national custom. The most noteworthy characteristic of life in France and Germany is the earlier hours at which places of business open in the summer compared with those usual in our cities. In Germany many schools open at 7 a.m., and the usual hour is 8 a.m. The people adapt themselves, therefore, to the daylight hours instead of pretending to do so by putting on the clocks by one hour in April and back an hour in September. In all places between the same latitudes as those of the British Isles, the relation of daylight to the time of the standard meridian is the same, so that whatever arguments can be advanced in favour of the proposed seasonal change of time in our country, beyond those of custom, would apply equally to the inhabited zone between fifty and sixty degrees completely round the world.

*It is only in a few great cities* in England that the waste of daylight described by the supporters of the Bill really exists; and even in these places it is possible for people to rise an hour earlier for work or recreation if they desire to do so. Industries and occupations which can best be carried on in daylight make the fullest use of daylight hours at present, without any legislative compulsion. Agricultural operations begin shortly after sunrise during a large part of the year, and continue until nearly sunset; in the building trades the hours of work vary with the hours of daylight, and the same is true in most engineering shops. But when work or pleasure can be carried on equally well in artificial light, there is a tendency to continue it to the limits of endurance. So it has come about that the bedtime hour in cities has been pushed further and further into the night, and the hour of rising has become later.

All that is needed is for banks, places of business, and schools to open at an earlier hour during the summer months, as they do in most places on the Continent. To introduce confusion into the whole system of time-reckoning because some people in cities have not sufficient strength of mind to make the best use of the daylight hours would be to acknowledge that, as we cannot alter our national habits and customs, Acts are passed by which we pretend to change them while they remain the same.

## PROF. JULIUS THOMSEN.

THE two great enrichers of thermal chemistry were Berthelot and Thomsen. Berthelot died in the spring of 1907, at the age of eighty; Thomsen has just left us, at the age of eighty-three. Born at Copenhagen in February, 1826, and educated in the polytechnic there, Thomsen became professor of chemistry in the university of his native city in 1866; he retired from the duties of his post in 1901, but continued to live and work in Copenhagen.

Julius Thomsen devoted his life to the experimental advancement of thermal chemistry. His first memoir on this subject was published in 1853, his last a few years before his death.

The permanent memorial of Thomsen's work is the four volumes of "Thermochemische Untersuchungen," published in the years 1882–86. In the year 1780 Lavoisier and Laplace announced that "all thermal changes . . . exhibited by a system of bodies which changes its state repeat themselves in the opposite direction when the system returns to its original condition." This generalisation was deduced from a theory of heat, and was to some extent verified by experiments. In the years 1839–42 Hess laid the foundations of thermal chemistry, sketched the lines on which the structure should be built, and began the building. Thomsen began his work soon after the appearance of Hess's memoirs. He has formed a stately building—adorned perhaps with too many crockets and pinnacles—resting on the sure foundation of experimentally established facts.

In the preface to his great work, "Thermochemische Untersuchungen," Thomsen tells us that he formed the plan of the whole before he began his experiments, and that he adhered almost rigorously to that plan. When the work was nearly completed, he recognised that the science of thermal chemistry would be benefited by collecting and digesting his materials, and so he published his investigations and his theoretical discussions thereof in the four volumes which have established his fame. In 1905 Thomsen published a *résumé* of his principal experimental results and discussions in one volume. Unfortunately, that book was written in Danish; fortunately for English workers in the field of thermal chemistry, *an English translation of it has appeared in* Longmans' series of text-books of physical chemistry, edited by Sir William Ramsay.

Thomsen set out with a determination to extend his thermal investigations over the whole field of chemistry. He carried that determination into effect. The first volume of the "Untersuchungen" deals with the thermochemical aspects of the neutralisation of acids and bases. The second volume is devoted to the reactions, and the classification of the affinity-phenomena of the non-metallic elements. The third volume is concerned with measurements of the heats of dissolution in water, with hydration, and with the affinity-phenomena of the metals. The thermochemical investigation of carbon compounds is the subject of the fourth volume.

The most important results of Thomsen's examination of neutralisation were the firm establishment of